

-1-

LUBRICATING BASE OIL BLEND

The invention relates to a lubricating base oil blend comprising (a) a mineral oil derived base oil having a saturates content of more than 90 wt%, a sulphur content of less than 0.03 wt% and a viscosity index (VI) of between 80-150 and a (b) a Fischer-Tropsch derived paraffinic base oil component having a kinematic viscosity at 100 °C of from 7 to 30 Cst (7 to 30 mm²/s). It further relates to a process for the preparation of such blends.

There is an increasing demand for lubricating base oils of high viscosity for a number of applications. However, the maximum achievable viscosity for either Group II and Group III base oils is defined by the origin and composition of the crude distillate or slack-wax feed employed. This is due to the fact that no molecular weight build-up during the preparation, and hence the maximum molecular weights and thus the related viscosity cannot be higher than of the high molecular weight compounds already present in the feed. Furthermore, during hydrotreatment or hydroprocessing steps the molecular weight of the obtained products is constantly reduced due to cracking reactions, as well as the structure of the compounds. As a result, applicants found it exceedingly difficult to prepare a API Group II base oil from a mineral oil derived feed to a kinematic viscosity at 100°C of above 12 cSt, since the severity of the hydroprocessing to achieve a desired saturates content of at least 90 wt% means that the obtainable maximum viscosity is limited due to cracking, and the molecular weight of feed. It was also found that this becomes even more enhanced in the case of API Group III base oils, where a maximum kinematic viscosity at 100°C

- 2 -

of not more than 9 cSt were achievable on the basis of mineral oil derived feedstocks. Less severe hydroprocessing treatments however resulted in failure to meet the base oil specifications, as well as in reduced oxidative and otherwise compromised stability.

A blend comprising a distillate base oil having a saturates content of more than 90 wt% and a residual Fischer-Tropsch derived paraffinic base oil component is disclosed in US-A-7053254. Applicants found that although blends of mineral derived base oils with a higher kinematic viscosity could be obtained through the addition of isomerised Fischer-Tropsch bottoms products as disclosed in US-A-7053254, the amount of the Fischer-Tropsch bottoms products that could be added without compromising the homogeneity of the blend was limited, as expressed by the high cloud points. As a result, the desired kinematic viscosity range at 100°C could not be achieved with blends that were clear and bright at ambient temperature for a prolonged period of time. Alternatively prior to the blends according to the subject invention, rather expensive and difficult to obtain highly viscous polyalphaolefin (PAO) fluids had to be employed to achieve a suitably high viscosity, and large amount of expensive and potentially shear unstable viscosity modifiers to obtain lubricating fluids having the desired viscosity level in combination with suitably high cloud points.

It is thus an object of the present invention to provide readily available lubricating base oil compositions that combine a high viscosity index and high saturates content with a low pour point, a low cloud point and a high kinematic viscosity without having to apply a severe a hydrotreatment/ hydrocracking step to the mineral component. A further object of the present

- 3 -

invention resides in providing for a process for the manufacture of such blends.

These objects have been achieved with the following composition:

5 A lubricating base oil blend comprising (a) a mineral oil derived base oil having a saturates content of more than 90 wt%, a sulphur content of less than 0.03 wt% and a viscosity index of between 80-150, and (b) a paraffinic base oil component having a viscosity at 100 °C of from 7
10 to 30 cSt, wherein component (b) is an isomerised Fischer-Tropsch derived bottoms product having a ratio of percentage of recurring methylene carbons which are four or more carbons removed from an end group and a branch to the percentage of isopropyl carbon atoms, as determined
15 by ^{13}C -NMR, of below 8,2. Figure 1 illustrates the cloud points of a number of blends of a a mineral derived Gp II base oil (a) with a paraffinic Fischer-Tropsch derived residual base oil components (b) from 1 to 10 %wt. Also the cloud points are shown. On the x-axis are shown the
20 %wt GTL extra heavy base oil (XHBO) in blend with 12 cSt Gp II base oil. On the y-axis the temperature is shown (°C). All blends were clear and bright by definition since all cloud points were negative.

As to component (a), lubricating base oils, which are
25 used for example to formulate engine lubricants and industrial oils, are normally prepared from suitable mineral oil feedstock by a variety of refining processes which are generally directed to obtaining a lubricating base oil with a predetermined set of properties, for
30 example viscosity, oxidation stability and maintenance of fluidity over a wide range of temperatures (as indicated by viscosity index). The preparation of lubricating base oils is conventionally carried out as follows: A mineral crude oil is separated by distillation at atmospheric
35 pressure into a number of distillate fractions and a

- 4 -

residue, known as long residue. The long residue is then separated by distillation at reduced pressure into a number of vacuum distillates and a vacuum residue known as short residue. From the vacuum distillate fractions lubricating base oils are prepared by refining processes. By these processes aromatics and wax are removed or chemically converted to acceptable distillate base oil molecular components from the vacuum distillate fractions. From the short residue asphalt can be removed by known deasphalting processes. From the deasphalted oil thus obtained aromatics and wax can subsequently be removed to yield a residual lubricating base oil, known as bright stock. The wax obtained during refining of the various lubricating base oil fractions is designated as "slack wax". Lubricating base oils are usually obtained from suitable vacuum distillate fractions and/or from deasphalted oil by suitable refining processes, including catalytic and solvent upgrading and dewaxing processes and catalytic hydrotreatment.

Mineral crude oil derived lubricating base oils are also referred to as a API Group I, II or III base oils as defined in API Publication 1509: Engine Oil Licensing and Certification System, "Appendix E-API Base Oil Inter-changeability Guidelines for Passenger Car Motor Oil and Diesel Engine Oils". In an article in the Oil & Gas Journal, Sept. 1, 1997, pages 63-70, various routes to API Group-II base oils are described. All of the possible routes will involve at one point the solvent extraction or hydrogenation of the aromatic and other unsaturated compounds to obtain a base oil having the desired saturates content. Such a hydrogenation will typically be performed by contacting the feed with hydrogen in the presence of a hydrogenation catalyst, typically a Group VIII metal supported catalyst, as for instance described in US-A-5935416.

- 5 -

While it is possible to obtain API Group II base oils in this way, API Group III base oils, i.e. having a viscosity index of at least 120 are more difficult to obtain directly by such processes. Instead, they are suitably obtained by hydrotreatment of the slack wax obtained in the refining operation, as for instance described in EP-A-178710. Alternatively, API Group III lubricating base oils can be obtained directly from high wax containing feedstocks derived from waxy crude oils, by a process comprising contacting a hydrocarbonaceous feedstock derived from a waxy crude oil with a hydroisomerisation catalyst under hydroisomerising conditions and subsequently recovering a lubricating base oil having a high viscosity index. Such a process is for instance described in EP-A-0400742. In both cases, the maximum obtainable kinematic viscosity of such base oils is determined by their maximum carbon number as expressed by the average number molecular weight and the molecular weight distribution of the feeds.

In the base oil blends according to the invention, the mineral derived base oil component (a) is preferably present in an amount of from 40 wt% to 98 wt%, based on the total weight of the oil blend, more preferably of from 50 to 97 wt%, more preferably of from 60 to 96 wt%, more preferably of from 70 to 95 wt%, more preferably of from 80 to 94 wt%, and more preferably of from 90 to 93 wt%. The remainder is the paraffinic base oil component (b). The base oil blend component (a) preferably has a kinematic viscosity at 100 °C of greater than 12.0 cSt, more preferably greater than 15.0 cSt still more preferably above 20.0 cSt, and a viscosity index of greater than 95, more preferably greater than 100. The viscosity index of component (a) is preferably between 100 and 110, but may be relaxed due to the high VI contribution of the component (b).

- 6 -

The base oil blend according to the invention preferably has a cloud point of below 0°C.

Preferably, in the base oil blend according to the invention, component (a) is an API Group II and/or an API Group III base oils as defined in API Publication 1509.

The Fischer-Tropsch derived paraffinic heavy base oil component (b) according to the invention is a heavy hydrocarbon composition comprising at least 95 wt% paraffin molecules. Preferably, the heavy base oil component (b) of the invention is prepared from a Fischer-Tropsch wax and comprises more than 98 wt% of saturated, paraffinic hydrocarbons. Preferably, at least 85 wt%, more preferably at least 90 wt%, yet more preferably at least 95 wt%, and most preferably at least 98 wt% of these paraffinic hydrocarbon molecules are isoparaffinic. Preferably, at least 85 wt% of the saturated, paraffinic hydrocarbons are non-cyclic hydrocarbons. Naphthenic compounds (paraffinic cyclic hydrocarbons) are preferably present in an amount of no more than 15 wt%, more preferably less than 10 wt%.

The Fischer-Tropsch derived paraffinic base oil component (b) contains hydrocarbon molecules having consecutive numbers of carbon atoms, such that it comprises essentially a continuous series of consecutive iso-paraffins, i.e. iso-paraffins having n, n+1, n+2, n+3 and n+4 carbon atoms. These consecutive numbers of carbon atoms is a consequence of the Fischer-Tropsch hydrocarbon synthesis reaction from which the wax feed, which has been subjected to isomerisation to form component (b).

Component (b) further is a liquid at 100°C and under ambient conditions, i.e. at 25°C and one atmosphere (101 kPa) absolute pressure.

The heavy hydrocarbon composition is typically a liquid at the temperature and pressure conditions of use

- 7 -

and typically, but not always, at ambient conditions of 24°C and one atmosphere (101 kPa) pressure.

The kinematic viscosity at 100°C (VK100) of component (b), as measured according to ASTM D-445, is at least 7 cSt (7 mm²/s). Preferably, the kinematic viscosity of the heavy hydrocarbon compositions of the invention at 100°C (VK100) is at least 10 cSt, more preferably at least 13 cSt, yet more preferably at least 15 cSt, again more preferably at least 17 cSt, yet again more preferably at least 20 cSt, and most preferably at least 25 cSt. Kinematic viscosity described in this specification was determined according to ASTM D-445.

The boiling range distribution of samples having a boiling range above 535°C was measured according to ASTM D-6352, while for lower boiling material, the boiling range distributions was measured according to ASTM D-2887.

The initial and end boiling points values referred to herein are nominal and refer to the T5 and T95 cut-points (boiling temperatures) obtained by gas chromatograph simulated distillation (GCD), using methods set out above.

Component (b) preferably has an initial boiling point of at least 400°C. More preferably, the initial boiling point is at least 450°C, yet more preferably at least 480°C, more preferably more than 500°C, yet more preferably more than 540°C.

Since conventional petroleum derived hydrocarbons and Fischer-Tropsch derived hydrocarbons comprise a mixture of varying molecular weights having a wide boiling range, this disclosure will refer to the 10 wt% recovery point and the 90 wt% recovery point of the respective boiling ranges. The 10 wt% recovery point refers to that temperature at which 10 wt% of the hydrocarbons present within that cut will vaporize at atmospheric pressure,

- 8 -

and could thus be recovered. Similarly, the 90 wt% recovery point refers to the temperature at which 90 wt% of the hydrocarbons present will vaporize at atmospheric pressure. When referring to a boiling range distribution, the boiling range between the 10 wt% and 90 wt% recovery boiling points is referred to in the subject specification.

Component (b) preferably according to the invention contains molecules having consecutive numbers of carbon atoms and preferably at least 95 wt% C₃₀+ hydrocarbon molecules. More preferably, component (b) preferably contains at least 75 wt% of C₃₅+ hydrocarbon molecules.

"Cloud point" refers to the temperature at which a sample begins to develop a haze, as determined according to ASTM D-5773. Component (b) typically has a cloud point between - 60°C and + 49°C.

In the base oil blend according to the invention, component (b) preferably has a pour point of below -28°C. Furthermore, in the base oil blend according to the invention, component (b) preferably has no measurable pour point depressing effect on the base oil blend, such that the pour points of the base oil blend is intermediate between those of the components (a) and (b) and not lower than either component (a) and (b).

Preferably, component (b) has a cloud point between 30°C and - 55°C, more preferably between 10°C and - 50°C. It was found that depending on the feed and the dewaxing conditions, some of the Fischer-Tropsch derived paraffinic heavy base oil component (b) would have a cloud point above ambient temperature, while other properties were not negatively affected.

"Pour point" refers to the temperature at which a base oil sample will begin to flow under carefully controlled conditions. The pour points referred to herein were determined according to ASTM D 97-93.

- 9 -

Molecular weights were determined according to ASTM D-2503. Viscosity index (VI) was determined by using ASTM D-2270.

5 The component (b) according to the subject invention preferably has a viscosity index of between 120-170, more preferably from 135 to 165, yet more preferably from 150 to 160.

10 Component (b) preferably will contain no or very little sulphur and nitrogen containing compounds. This is typical for a product derived from a Fischer-Tropsch reaction, which uses synthesis gas containing almost no impurities. Preferably, component (b) comprises sulphur, nitrogen and metals in the form of hydrocarbon compounds containing in amounts of less than 50 ppmw, more
15 preferably less than 20 ppmw, yet more preferably less than 10 ppmw. Most preferably it will comprise sulphur and nitrogen at levels generally below the detection limits, which are currently 5 ppm for sulphur and 1 ppm for nitrogen when using for instance by X-ray or Antek
20 Nitrogen tests for determination. However, sulphur may be introduced through the use of sulphided hydrocracking/hydrodewaxing and/or sulphided catalytic dewaxing catalysts.

25 Furthermore, it was found that there appears to be a correlation between the kinematic viscosity, the pour point and the pour point depressing effect that an isomerised Fischer-Tropsch derived bottoms product could have. At a given feed composition and boiling range (as defined by the lower cut point from the distillate base
30 oil and gas oil fractions after dewaxing) for the bottoms product, the pour point and the obtainable viscosity are linked to the severity of the dewaxing treatment. It was found that a pour point depressing effect was noticeable for isomerised Fischer-Tropsch derived bottoms products
35 having a pour point of above -28 °C an average molecular

- 10 -

weight between about 600 and about 1100 and an average degree of branching in the molecules between about 6.5 and about 10 alkyl branches per 100 carbon atoms as disclosed in US-A-7053254.

5 The Fischer-Tropsch derived paraffinic base oil component (b) in the present invention is preferably separated as residual fraction from the hydrocarbons produced during a Fischer-Tropsch synthesis reaction and subsequent hydrocracking and dewaxing steps.

10 More preferably this fraction is a distillation residue comprising the highest molecular weight compounds still present in the product of the hydroisomerisation step. The 10 wt% recovery boiling point of said fraction is preferably above 370 °C, more preferably above 400 °C
15 and most preferably above 500 °C for certain embodiments of the present invention.

 It further has an average degree of branching in the molecules of above 10 alkyl branches per 100 carbon atoms, as determined in line with the method disclosed in
20 US-A-7053,254.

 The Fischer-Tropsch derived paraffinic base oil component (b) according to the invention can further be specified by its content of different carbon species. More particular, the Fischer-Tropsch derived paraffinic
25 base oil component (b) can be specified by the percentage of its epsilon methylene carbon atoms, i.e. the percentage of recurring methylene carbons which are four or more carbons removed from an end group and a branch (further referred to as CH₂>4) as compared to the
30 percentage of isopropyl carbon atoms.

 It was found that isomerised Fischer-Tropsch bottoms products as disclosed in US-A-7053254 differ from the Fischer-Tropsch derived paraffinic base oil components according to the present invention, which are usually
35 obtained at a higher dewaxing severity in that the latter

- 11 -

compounds have a ratio of percentages epsilon methylene carbon atoms to carbon atoms in isopropyl branches of at or above 8.2, as measured on the Fischer Tropsch base oil as a whole. It has been in particular found that a
5 Fischer-Tropsch product as disclosed in US-A-7053254 with a mild degree of isomerisation was not suitable for addition in amounts larger than 1.5 to 2 wt% due to its inability to achieve clear and bright blend.

It was found that a measurable pour point depressing
10 effect through base stock blending as disclosed in US-A-7053254 was only achieved if in component (b) the ratio of percentages of epsilon methylene carbon atoms to carbon atoms in isopropyl branches was above or at 8.2.

Therefore the Fischer-Tropsch derived base oil
15 component (b) according to the subject invention has a pour point of below -28°C. Such a component (b) will have no or only a negligible pour point depressing effect such that the pour points of the base oil blends comprising components (a) and (b) are intermediate between the pour
20 points of the components.

The branching properties as well as the carbon composition of the Fischer-Tropsch derived base oil blending components can conveniently be determined by
analyzing a sample of oil using C¹³-NMR, vapour pressure
25 osmometry (VPO) and Field Ionization Mass Spectrometric Analysis Field ionization mass spectrometry (FIMS) as follows.

The average molecular mass was obtained via vapour pressure osmometry (VPO). Then samples were characterized
30 at the molecular level by means of nuclear magnetic resonance (NMR) spectroscopy. The "Z" content and the average carbon number was determined by FIMS.

Conventional NMR spectra have the problem of signal overlap due to the presence of a great number of isomers
35 in the base oil composition. To overcome the problem of

- 12 -

signal overlap, selected multiplet subspectral carbon-13 nuclear magnetic resonance (^{13}C -NMR) analyses were applied. In particular, gated spin echo (GASPE) were applied to obtain quantitative CH_n subspectra. The

5 quantitative data obtained from GASPE have a better accuracy than those from distortionless enhancement by polarization transfer (DEPT, as for instance applied in the process disclosed in US-A-7053254).

On the basis of the GASPE data and of the average

10 molecular mass obtained via vapour pressure osmometry (VPO), the average number of branches and aliphatic rings can be calculated. Further, on the basis of GASPE, the distribution of side chain lengths and the positions of the methyl groups along the straight chain were obtained.

15 Quantitative carbon multiplicity analysis is normally carried out entirely at room temperature. However this is only applicable to materials which are liquid under these conditions. This method is applicable to any synthetic (e.g. Fischer-Tropsch) derived or mineral

20 derived base oil material which is hazy or a waxy solid at room temperature, and therefore cannot be run by the normal method. The methodology for the NMR measurements was as follows: As solvent for determination of quantitative carbon multiplicity analysis, deuterated

25 chloroform (CDCl_3) was employed, limiting the maximum measurement temperature to 50°C for practical reasons. A base oil sample is heated in an oven at 50°C until it forms a clear and liquid homogeneous product. A portion of the sample is then transferred into an NMR tube.

30 Preferably, the NMR tube and any apparatus used in the transfer of the sample is kept at this temperature. The above-identified solvent is then added and the tube shaken to dissolve the sample, optionally involving reheating of the sample. To prevent solidification of any

35 high melting material in the sample, the NMR instrument

- 13 -

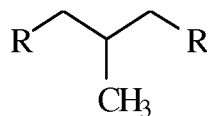
is maintained at 50°C during acquisition of the data. The sample is placed in the NMR instrument for a minimum of 5 minutes is required for the temperature to equilibrate. After this the instrument must be re-shimmed and re-tuned as both these adjustments will change considerably at the elevated temperature, and the NMR data could now be acquired.

A CH₃ subspectrum was obtained using the GASPE pulse sequence, obtained by addition of a CSE spectrum (standard spin echo) to a 1/J GASPE (gated acquisition spin echo). The resultant spectrum contains primary (CH₃) and tertiary carbon (CH) peaks only. Then the various carbon branch carbon resonances were assigned to specific positions and lengths applying tabulated data, and correcting for chain ends. Then the subspectrum was integrated to give quantitative values for the various different CH₃ signals as follows.

1) CH₃-carbon

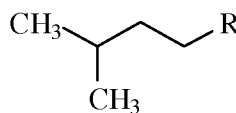
a. 25 ppm chemical shift (referenced against TMS).

b. 19 and 21 ppm can be identified as methyl branches of the following general type (see formula 1):



Formula 1

c. Distinct intense signals in the region of 22 to 24 ppm can be unambiguously identified as isopropyl end groups of the following general structure (see Formula 2).



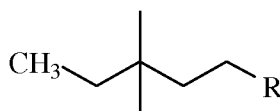
Formula 2

- 14 -

In this instance, one of the methyl carbon atoms is classified as termination of the main chain, the other as being a branch. Therefore when calculating methyl branch content the intensity of these signals is halved.

5 d. Further, several weak signals in the region of 15 to 19 ppm are considered to belong to isopropyl group with an additional branch in the 3 position.

e. Observed in the spectrum are some weak signals in the region 8 to 8.5 ppm, most likely pertaining to 3,3-dimethyl substituted structures (Formula 3):



Formula 3

In this case the observed signal is for the terminal CH₃, but there are two corresponding methyl branches. Therefore the integral value of these signals is doubled (the signals for the two methyl branches are not counted independently).

15 The overall estimation of methyl branch content is thus based on the following calculation ("Int" representing the term "Integral", Formula 4):

20 Σ (integrals methyls) = Int 19 to 20 ppm + (Int 22 to 25 ppm)/2 + Int 15 to 19 ppm + (Int 7.0 to 9 ppm)*2

2) The calculation of ethyl branch content is based on two distinct relatively intense signals observed at 11.5 and at 10.9 ppm, assuming the isopentyl end group content to be negligible, based on the evidence from other peak assignments. Hence, the calculation of ethyl branch content is based solely on the integral of the signals at 10 to 11.2 ppm.

25 3) The overall theoretical terminal CH₃ content was calculated based on the "Z" content and the average carbon number, as determined by FIMS. The C₃+ branch content is then determined by subtracting from the

- 15 -

theoretical terminal CH₃ content the known terminal CH₃ contents i.e. half of the isopropyl value, the 3-methyl substituted value and the value for 3,3-dimethyl substituted structures, thereby resulting in a value for the signals in the 14 ppm region which belong to CH₃'s terminating the chain, the difference being the value for the C3+ branches:

$$\Sigma (\text{integrals C3+ branches}) = \text{Int 14-15 ppm} - ((\text{theoretical terminal CH}_3) - (\text{Int 11.2 to 11.8 ppm}) - (\text{Int 22 to 25 ppm})/2 - \text{Int 7 to 9 ppm}).$$

The present invention further relates to a process for the preparation of a lubricant base oil blend, comprising blending

(a) a mineral oil derived base oil having a saturates content of more than 90 wt%, a sulphur content of less than 0.03 wt% and a viscosity index of between 80-150, and

(b) a paraffinic base oil component having a viscosity at 100°C of from 7 to 30 cSt (7 to 30 mm²/s), wherein component (b) is an isomerised Fischer-Tropsch derived bottoms product having a ratio of percentage of recurring methylene carbons which are four or more carbons removed from an end group and a branch to the percentage of isopropyl carbon atoms, as determined by ¹³C-NMR, of below 8,2.

Preferably, the present invention also relates to a process for the preparation of a lubricating base oil having a saturates content of more than 90 wt%, a sulphur content of less than 0.03 wt%, a viscosity index of between 80-150, comprising (a) contacting a mineral oil derived feed as described above with hydrogen in the presence of a hydrogenation catalyst, and (b) blending of the obtained product with a Fischer-Tropsch derived component (b) according to any one of claims 1 to 7.

- 16 -

More preferably, the above process comprises the steps

(i) contacting a mineral oil derived lubricating base oil precursor product having a saturates content of below 90 wt% and a sulphur content of between 300 ppmw and 2 wt% with a suitable sulphided hydrotreating catalyst in the presence of hydrogen in a first hydrotreating step at a temperature of between 250 and 350 °C; and

(ii) separating the effluent of step (i) into a gaseous fraction and a liquid fraction, wherein the liquid fraction has a sulphur content of between 50 and 1000 ppmw and a nitrogen content of less than 50 ppmw;

(iii) contacting the liquid fraction of step (ii) with a catalyst comprising a noble metal component supported on an amorphous refractory oxide carrier in the presence of hydrogen in a second hydrotreating step;

(iv) recovering the lubricating base oil having the specified properties, and

(v) blending the base oil obtained in step (iv) with the paraffinic base oil component (b).

Preferably, the hydrotreating catalyst in step (i) comprises at least one Group VIB metal component and a metal selected from the group consisting of iron, nickel and cobalt and a refractory oxide support.

Yet more preferably, the catalyst of step (i) is a nickel/molybdenum on alumina catalyst having a nickel content 1-5 wt% as oxide and a molybdenum content of between 10-30 wt% as oxide. Again more preferably, the catalyst of step (iii) comprises platinum and palladium and an amorphous silica/alumina support, wherein the total amount of platinum and palladium is between 0.2 and 5 wt%.

Preferably, the lubricating base oil product is obtained by solvent extraction of a petroleum fraction boiling in the lubricating oil range, followed by solvent

- 17 -

dewaxing and/or catalytic dewaxing. Preferably, the lubricating base oil product is an API Group I base oil and the product obtained in step (d) is an API Group II or Group III base oil.

5 Preferably, the paraffinic base oil component (b) is a heavy bottom heavy bottom distillate fraction obtained from a Fischer-Tropsch derived wax or waxy raffinate feed by:

10 (a) hydrocracking/hydroisomerisating a Fischer-Tropsch derived feed, wherein at least 20 wt% of compounds in the Fischer-Tropsch derived feed have at least 30 carbon atoms;

15 (b) separating the product of step (a) into one or more distillate fraction(s) and a residual heavy fraction comprising at least 10% wt. of compounds boiling above 540°C;

 (c) subjecting the residual fraction to a catalytic pour point reducing step; and

20 (d) isolating from effluent of step (c) as a residual heavy fraction the Fischer-Tropsch derived paraffinic base oil component.

25 More preferably, the paraffinic base oil component (b) is a heavy bottom heavy bottom distillate fraction obtained from a Fischer-Tropsch derived wax or waxy raffinate feed by:

30 a) hydrocracking/hydroisomerisating a Fischer-Tropsch derived feed, wherein weight ratio of compounds having at least 60 or more carbon atoms and compounds having at least 30 carbon atoms in the Fischer-Tropsch derived feed is at least 0.2 and wherein at least 30 wt% of compounds in the Fischer-Tropsch derived feed have at least 30 carbon atoms;

35 (b) separating the product of step (a) into one or more distillate fraction(s) of lower boiling fractions and a broad range base oil precursor fraction and a heavy

- 18 -

fraction such that the T90 wt% boiling point of the base oil precursor fraction is between 350 and 550 °C;

(c) performing a pour point reducing step to the broad range base oil precursor fraction obtained in step (b); and

(d) isolating the heavy bottom distillate fraction by distilling the product of step (c).

In addition to isomerisation and fractionation, the Fischer-Tropsch derived product fractions may undergo various other operations, such as hydrocracking, hydrotreating, and hydrofinishing.

The feed of step (a) is a Fischer-Tropsch derived product. The initial boiling point of the Fischer-Tropsch product may range up to 400 °C, but is preferably below 200 °C. Preferably any compounds having 4 or less carbon atoms and any compounds having a boiling point in that range are separated from a Fischer-Tropsch synthesis product before the Fischer-Tropsch synthesis product is used in said hydroisomerisation step. An example of a suitable Fischer-Tropsch process is described in WO-A-9934917 and in AU-A-698391. The disclosed processes yield a Fischer-Tropsch product as described above.

The Fischer-Tropsch product will contain no or very little sulphur and nitrogen containing compounds. This is typical for a product derived from a Fischer-Tropsch reaction, which uses synthesis gas containing almost no impurities. Sulphur and nitrogen levels will generally be below the detection limits, which are currently 5 ppm for sulphur and 1 ppm for nitrogen.

The Fischer-Tropsch product can be obtained by well-known processes, for example the so-called Sasol process, the Shell Middle Distillate Process or by the ExxonMobil "AGC-21" process. These and other processes are for example described in more detail in EP-A-776959, EP-A-668342, US-A-4943672, US-A-5059299, WO-A-9934917 and

- 19 -

WO-A-9920720. The process will generally comprise a Fischer-Tropsch synthesis and a hydroisomerisation step as described in these publications. The Fischer-Tropsch synthesis can be performed on synthesis gas prepared from
5 any sort of hydrocarbonaceous material such as coal, natural gas, biological matter such as wood or hay.

The Fischer-Tropsch product directly obtained from a Fischer-Tropsch process contains a waxy fraction that is normally a solid at room temperature.

10 The Fischer-Tropsch wax used as the feed for the present process, is obtained via the well-known Fischer-Tropsch hydrocarbon synthesis process. In general, such Fischer-Tropsch hydrocarbon synthesis involves the preparation of hydrocarbons from a mixture of carbon
15 monoxide and hydrogen at elevated temperature and pressure in the presence of a suitable catalyst. The Fischer-Tropsch catalyst normally is selective for preparing paraffinic molecules, mostly straight-chain paraffins, and the product from a Fischer-Tropsch
20 synthesis reaction therefore usually is a mixture of a large variety of paraffinic molecules. Those hydrocarbons that are gaseous or liquid at room temperature are recovered separately, for instance as fuel gas (C5-), solvent feedstocks and detergent feedstocks (up to C17).
25 The heavier paraffins (C18+) are recovered as one or more wax fractions, commonly referred to as Fischer-Tropsch wax(es) or synthetic wax(es). For the purpose of the present invention only those Fischer-Tropsch waxes are useful as the feed, which meet the aforementioned
30 requirements with respect to their boiling range and congealing point. Preferred Fischer-Tropsch wax feeds are those having a congealing point in the range of from 55 to 150 °C, more preferably from 60 to 120 °C and/or such boiling range that the T90-T10 is in the range of
35 from 50 to 130 °C. Fischer-Tropsch waxes melting below

- 20 -

100 °C, suitably have a kinematic viscosity at 100 °C (Vk100) of at least 3 cSt (3 mm²/s), preferably between 3 and 12 cSt, more preferably between 4 and 10 cSt. Those Fischer-Tropsch waxes melting above 100 °C suitably have
5 a kinematic viscosity at a temperature T, which is 10 to 20 °C higher than their melting point, in the range of from 8 to 15 cSt, preferably from 9 to 14 cSt.

In case the feed to step (a) has a 10 wt% recovery boiling point of above 500 °C the wax content will
10 suitably be greater than 50 wt%. The feed to the hydroisomerisation step is preferably a Fischer-Tropsch product which has at least 30 wt%, preferably at least 50 wt%, and more preferably at least 55 wt% of compounds having at least 30 carbon atoms. Furthermore the weight
15 ratio of compounds having more than 30 to at least 60 or more carbon atoms to compounds having at least 30 carbon atoms to less than 60 carbon atoms of the Fischer-Tropsch product is at least 0.2, preferably at least 0.4 and more preferably at least 0.55.

20 Preferably the Fischer-Tropsch product comprises a C20+ fraction having an ASF-alpha value (Anderson-Schulz-Flory chain growth factor) of at least 0.925, preferably at least 0.935, more preferably at least 0.945, even more preferably at least 0.955. Preferably, the Fischer-
25 Tropsch wax feed for step (a) has a weight ratio of compounds having at least 60 or more carbon atoms and compounds having at least 30 carbon atoms in the Fischer-Tropsch derived feed is at least 0.2, more preferably at least 0.4.

30 The hydrocracking/hydroisomerisation reaction of the hydroisomerisation is preferably performed in the presence of hydrogen and a catalyst, which catalyst can be chosen from those known to one skilled in the art as being suitable for this reaction. Catalysts for use in
35 the hydroisomerisation typically comprise an acidic

- 21 -

functionality and a hydrogenation - dehydrogenation
functionality. Preferred acidic functionality's are
refractory metal oxide carriers. Suitable carrier
materials include silica, alumina, silica-alumina,
5 zirconia, titania and mixtures thereof. Preferred carrier
materials for inclusion in the catalyst for use in the
process of this invention are silica, alumina and silica-
alumina. A particularly preferred catalyst comprises
platinum supported on a silica-alumina carrier.
10 Preferably the catalyst does not contain a halogen
compound, such as for example fluorine, because the use
of such catalysts require special operating conditions
and involve environmental problems. Examples of suitable
hydrocracking/hydroisomerisation processes and suitable
15 catalysts are described in WO-A-0014179, EP-A-532118,
EP-A-666894 and the earlier referred to EP-A-776959.

Preferred hydrogenation - dehydrogenation
functionality's are Group VIII metals, for example
cobalt, nickel, palladium and platinum and more
20 preferably platinum. In case of platinum and palladium
the catalyst may comprise the hydrogenation -
dehydrogenation active component in an amount of from
0.005 to 5 parts by weight, preferably from 0.02 to
2 parts by weight, per 100 parts by weight of carrier
25 material. In case nickel is used a higher content will be
present, optionally nickel is used in combination with
copper. A particularly preferred catalyst for use in the
hydroconversion stage comprises platinum in an amount in
the range of from 0.05 to 2 parts by weight, more
30 preferably from 0.1 to 1 parts by weight, per 100 parts
by weight of carrier material. The catalyst may also
comprise a binder to enhance the strength of the
catalyst. The binder can be non-acidic. Examples are
clays and other binders known to one skilled in the art.

- 22 -

In the hydroisomerisation the feed is contacted with hydrogen in the presence of the catalyst at elevated temperature and pressure. The temperatures typically will be in the range of from 175 to 380 °C, preferably higher than 250 °C and more preferably from 300 to 370 °C. The pressure will typically be in the range of from 10 to 250 bar and preferably between 20 and 80 bar. Hydrogen may be supplied at a gas hourly space velocity of from 100 to 10000 Nl/l/hr, preferably from 500 to 5000 Nl/l/hr. The hydrocarbon feed may be provided at a weight hourly space velocity of from 0.1 to 5 kg/l/hr, preferably higher than 0.5 kg/l/hr and more preferably lower than 2 kg/l/hr. The ratio of hydrogen to hydrocarbon feed may range from 100 to 5000 Nl/kg and is preferably from 250 to 2500 Nl/kg.

The conversion in the hydroisomerisation as defined as the weight percentage of the feed boiling above 370 °C which reacts per pass to a fraction boiling below 370 °C, is at least 20 wt%, preferably at least 25 wt%, but preferably not more than 80 wt%, more preferably not more than 70 wt%. The feed as used above in the definition is the total hydrocarbon feed fed to the hydroisomerisation, thus also any optional recycle to step (a).

The resulting product of the hydroisomerisation process preferably contains at least 50 % by weight of iso-paraffins, more preferably at least 60 % by weight, yet more preferably at least 70 % by weight of iso-paraffins, the remainder being composed of n-paraffins and naphthenic compounds.

In step (b), the product of step (a) is separated into one or more distillate fraction(s) and a residual heavy fraction comprising at least 10% wt. of compounds boiling above 540°C.

This is conveniently done by performing one or more distillate separations on the effluent of the

- 23 -

hydroisomerisation step to obtain at least one middle distillate fuel fraction and a residual fraction which is to be used in step (c).

5 Preferably the effluent of step (a) is first subjected to an atmospheric distillation. The residue as obtained in such a distillation is may in certain preferred embodiments be subjected to a further distillation performed at near vacuum conditions to arrive at a fraction having a higher 10 wt% recovery boiling point.

The 10 wt% recovery boiling point of the residue may preferably vary between 350 and 550 °C. This atmospheric bottom product or residue preferably boils for at least 95 wt% above 370 °C.

15 This fraction may be directly used in step (c) or may be subjected to an additional vacuum distillation suitably performed at a pressure of between 0.001 and 0.1 bara. The feed for step (c) is preferably obtained as the bottom product of such a vacuum distillation.

20 In step (c), the heavy residual fraction obtained in step (b) is subjected to a catalytic pour point reducing step. Step (c) may be performed using any hydroconversion process, which is capable of reducing the wax content to below 50 wt% of the original wax content. The wax content in the intermediate product is preferably below 35 wt% and more preferably between 5 and 35 wt%, and even more preferably between 10 and 35 wt%. The product as obtained in step (c) preferably has a congealing point of below 80 °C. Preferably more than 50 wt% and more preferably more than 70 wt% of the intermediate product boils above the 10 wt% recovery point of the wax feed used in step (a). The wax content as used in the description is measured according to the following procedure. 1 weight part of the to be measured oil fraction is diluted with 35 4 parts of a (50/50 vol/vol) mixture of methyl ethyl

- 24 -

ketone and toluene, which is subsequently cooled to
-20 °C in a refrigerator. The mixture is subsequently
filtered at -20 °C. The wax is thoroughly washed with
cold solvent, removed from the filter, dried and weighed.
5 If reference is made to oil content a wt% value is meant
which is 100% minus the wax content in wt%.

A possible process is the hydroisomerisation process
as described above for step (a). It has been found that
the wax may be reduced to the desired level using such
10 catalyst. By varying the severity of the process
conditions as described above a skilled person will
easily determine the required operating conditions to
arrive at the desired wax conversion. However a
temperature of between 300 and 330 °C and a weight hourly
15 space velocity of between 0.1 and 5, more preferably
between 0.1 and 3 kg of oil per litre of catalyst per
hour (kg/l/hr) are especially preferred for optimising
the oil yield.

A more preferred class of catalyst, which may be
20 applied in step (c), is the class of dewaxing catalysts.
The process conditions applied when using such catalysts
should be such that a wax content remains in the oil. In
contrast typical catalytic dewaxing processes aim at
reducing the wax content to almost zero. Using a dewaxing
25 catalyst comprising a molecular sieve will result in that
more of the heavy molecules are retained in the dewaxed
oil. Thus a more viscous base oil can then be obtained.

The dewaxing catalyst which may be applied in
step (c) suitably comprises a molecular sieve and
30 optionally in combination with a metal having a
hydrogenation function, such as the Group VIII metals.
Molecular sieves, and more suitably molecular sieves
having a pore diameter of between 0.35 and 0.8 nm have
shown a good catalytic ability to reduce the wax content
35 of the wax feed. Suitable zeolites are mordenite, beta,

- 25 -

ZSM-5, ZSM-12, ZSM-22, ZSM-23, SSZ-32, ZSM-35 and ZSM-48 or combinations of said zeolites, of which ZSM-12 and ZSM-48 are most preferred. Another preferred group of molecular sieves are the silica-aluminophosphate (SAPO) materials of which SAPO-11 is most preferred as for example described in US-A-4859311. ZSM-5 may optionally be used in its HZSM-5 form in the absence of any Group VIII metal. The other molecular sieves are preferably used in combination with an added Group VIII metal. Suitable Group VIII metals are nickel, cobalt, platinum and palladium. Examples of possible combinations are Pt/ZSM-35, Ni/ZSM-5, Pt/ZSM-23, Pd/ZSM-23, Pt/ZSM-48 and Pt/SAPO-11 or stacked configurations of Pt/zeolite beta and Pt/ZSM-23, Pt/zeolite beta and Pt/ZSM-48 or Pt/zeolite beta and Pt/ZSM-22. Further details and examples of suitable molecular sieves and dewaxing conditions are for example described in WO-A-9718278, US-A-4343692, US-A-5053373, US-A-5252527, US-A-20040065581, US-A-4574043 and EP-A-1029029.

Another preferred class of molecular sieves are those having a relatively low isomerisation selectivity and a high wax conversion selectivity, like ZSM-5 and ferrierite (ZSM-35).

The dewaxing catalyst suitably also comprises a binder. The binder can be a synthetic or naturally occurring (inorganic) substance, for example clay, silica and/or metal oxides. Natural occurring clays are for example of the montmorillonite and kaolin families. The binder is preferably a porous binder material, for example a refractory oxide of which examples are: alumina, silica-alumina, silica-magnesia, silica-zirconia, silica-thoria, silica-beryllia, silica-titania as well as ternary compositions for example silica-alumina-thoria, silica-alumina-zirconia, silica-alumina-magnesia and silica-magnesia-zirconia. More preferably a

- 26 -

low acidity refractory oxide binder material, which is essentially free of alumina, is used. Examples of these binder materials are silica, zirconia, titanium dioxide, germanium dioxide, boria and mixtures of two or more of these of which examples are listed above. The most preferred binder is silica.

A preferred class of dewaxing catalysts comprise intermediate zeolite crystallites as described above and a low acidity refractory oxide binder material which is essentially free of alumina as described above, wherein the surface of the aluminosilicate zeolite crystallites has been modified by subjecting the aluminosilicate zeolite crystallites to a surface dealumination treatment. A preferred dealumination treatment is by contacting an extrudate of the binder and the zeolite with an aqueous solution of a fluorosilicate salt as described in for example US-A-5157191 or WO-A-0029511. Examples of suitable dewaxing catalysts as described above are silica bound and dealuminated Pt/ZSM-5, silica bound and dealuminated Pt/ZSM-35 as for example described in WO-A-0029511 and EP-B-832171.

The conditions in step (c) when using a dewaxing catalyst typically involve operating temperatures in the range of from 200 to 500 °C, suitably from 250 to 400 °C. Preferably the temperature is between 300 and 330 °C. The hydrogen pressures in the range of from 10 to 200 bar, preferably from 40 to 70 bar, weight hourly space velocities (WHSV) in the range of from 0.1 to 10 kg of oil per litre of catalyst per hour (kg/l/hr), suitably from 0.1 to 5 kg/l/hr, more suitably from 0.1 to 3 kg/l/hr and hydrogen to oil ratios in the range of from 100 to 2,000 litres of hydrogen per litre of oil.

It was found that when a dewaxing severity of about 30% per pass had been surpassed in step (c), the yield and pour point dropped exponentially until a further

- 27 -

plateau was reached at a pour point in the range of from -50 to -60°C. It was further found that isomerised Fischer-Tropsch derived bottoms products obtained that had a pour point of below -28°C were found to show a much reduced pour point reducing effect, or were no longer pour point depressing.

However, at the same time it was found that higher amounts of isomerised Fischer-Tropsch derived bottoms products of such reduced pour points could be added to a mineral base oil component (a) to achieve high viscosities without increasing the cloud point to at or above ambient temperature.

In step (d), the product of step (c) is usually sent to a vacuum column where the various distillate base oil cuts are collected. These distillate base oil fractions may be used to prepare lubricating base oil blends, or they may be cracked into lower boiling products, such as diesel or naphtha. The residual material collected from the vacuum column comprises a mixture of high boiling hydrocarbons, and is used to prepare component (b) of the present invention.

Furthermore, the product obtained in step (c) may also be subjected to additional treatments, such as solvent dewaxing. The product obtained in the process according to the present invention can be further treated, for example in a clay treating process or contacting with active carbon, as for example described in US-A-4795546 and EP-A-712922, in order to improve the stability.

It was also found that the saturates level, the pour point and the VI of a Group II and III base oils could be relaxed when used in blends according to the invention, since the addition of the component (b) due to its high saturation level, very low pour point and high VI permitted to achieve targeted values of V_k 100°C, pour

- 28 -

point and VI. Accordingly, the cracking severity of the mineral oil feed could be reduced, resulting in a yield advantage on the mineral oil feed. Therefore, the subject invention also relates to a process for the preparation of a lubricating base oil having a saturates content of more than 90 wt%, a sulphur content of less than 0.03 wt%, a viscosity index of between 80-150, comprising (a) contacting a mineral oil derived feed as described above with hydrogen in the presence of a hydrogenation catalyst, and (b) blending of the obtained product with a Fischer-Tropsch derived component (b) as obtained as set out above.

Furthermore, API Group II based formulations with low additive treatment rates, and hence low additive thickening such as e.g. SAE 40 or 50 monograde gas engine oils could be achieved through blending According to the invention. This is otherwise difficult since the SAE kinematic viscosity requirement is at least 12.5 mm²/s (cSt) or respectively 16.3 mm²/s (cSt) at 100 °C.

The product obtained in the process according to the present invention can be further treated, for example in a clay treating process or contacting with active carbon, as for example described in US-A-4795546 and EP-A-712922, in order to improve the stability of the base oil.

The invention will be illustrated by the following non-limiting examples.

Examples

Preparation of a dewaxing catalyst

MTW Type zeolite crystallites were prepared as described in "Verified synthesis of zeolitic materials" as published in Micropores and mesopores materials, volume 22 (1998), pages 644-645 using tetra ethyl ammonium bromide as the template. The Scanning Electron Microscope (SEM) visually observed particle size showed ZSM-12 particles of between 1 and 10 µm. The average

- 29 -

crystallite size as determined by XRD line broadening technique was 0.05 μm . The crystallites thus obtained were extruded with a silica binder (10% by weight of zeolite, 90% by weight of silica binder). The extrudates were dried at 120 °C. A solution of $(\text{NH}_4)_2\text{SiF}_6$ (45 ml of 0.019 N solution per gram of zeolite crystallites) was poured onto the extrudates. The mixture was then heated at 100 °C under reflux for 17 h with gentle stirring above the extrudates. After filtration, the extrudates were washed twice with deionised water, dried for 2 hours at 120 °C and then calcined for 2 hours at 480 °C.

The thus obtained extrudates were impregnated with an aqueous solution of platinum tetramine hydroxide followed by drying (2 hours at 120 °C) and calcining (2 hours at 300 °C). The catalyst was activated by reduction of the platinum under a hydrogen rate of 100 l/hr at a temperature of 350 °C for 2 hours. The resulting catalyst comprised 0.35% by weight Pt supported on the dealuminated, silica-bound MTW zeolite.

Example 1: Preparation of a Fischer-Tropsch derived component (b)

A Fischer-Tropsch derived wax that had been subjected to a hydrocracking/hydrosmerisation treatment, and further comprised at least 80% wt. of isoparaffins having the properties as in Table 1 was distilled into a light base oil precursor fraction boiling substantially between 390 and 520 °C and a residual heavy fraction boiling above 520 °C.

Table 1

Density at 70 °C (kg/l)	0.7874
T10wt% (°C)	346
T50wt% (°C)	482
T90wt% (°C)	665
Congeaing point (°C)	48

- 30 -

The residual base oil precursor fraction was contacted with the above-described dewaxing catalyst. The dewaxing conditions were 40 bar hydrogen, WHSV = 1 kg/l.h, a temperature of 340 °C and a hydrogen gas rate of 700 Nl/kg feed. The dewaxed oil was separated by distillation into a light base oil component, and a heavy base oil component having the properties listed in Table 2.

Table 2

	Heavy base oil
Boiling range of base oil product (°C)	>520
Yield on feed to dewaxing	54.3
Density at 20 °C (kg/l)	0.8336
Pour point (°C)	-42
Kinematic viscosity at 100 °C (cSt)	15.95
Viscosity Index	168
Average molecular weight	692

Example 2

A mineral oil derived API Group I bright stock having a viscosity index of 95, and a kinematic viscosity at 100 °C of 32 cSt was blended with a number of Fischer-Tropsch derived base oil components according to the invention (A, B, and C), as well as a number not according to the invention (Comparative A and B), which had been obtained from a less severe dewaxing step.

The limit at which the mixture still had a negative cloud point and hence was clear and bright was determined by making several blends of different concentration. The limits to which the Fischer-Tropsch derived component could be added to arrive at a clear and bright blend after several days at ambient temperature are given as clear and bright limits. The limit for Fischer-Tropsch derived bottom products not according to the present

- 31 -

invention, i.e. having a ratio of wt.% of carbons in $\text{CH}_2 > 4$ (from all C) to wt.% of carbons in isopropyl groups of above 8,2 was clearly below those of the Fischer-Tropsch derived components according to the invention.

Table 3

	A	B	C	Comp.A	Comp.B
Vk @ 40°C	173,1	192,3	229,3	259,7	241,0
Vk @ 100°C	20,48	22,49	25,15	26,63	26,49
Cloud Point FT base oil component	15	26	34	n.d.	36
Pour Point Base oil component	-42	-45	-30	-6	-6
$\text{CH}_2 > 4$ /total (wt.%)	12,0	14,9	17,4	21	19,5
Carbons in isopropyl groups (wt. %)	3,0	2,4	2,4	1,96	2,1
wt.% of carbons in $\text{CH}_2 > 4$ (from all C) to wt.% of carbons in iso-propyl groups	4,0	6,2	7,2	10,7	9,3
Clear and Bright limit (wt.%)	38	28	25	15	20

5 Example 3 Blends with API Gp II base oil

A further set of blends was prepared with an API Gp II base oil and a Fischer-Tropsch derived base oil component according to the invention. Properties of the starting components are given in Table 4.

Table 4

		Gp II Base oil	FT Heavy Base Oil
Vk @ 40°C	ASTM D 445	110	n.d.
Vk @ 70°C	ASTM D 445	n.d.	43,21
Vk @ 100°C	ASTM D 445	12,2	19,0
VI	ASTM D 2270	97	n.d.
Sulphur (wt.%, X-Ray)	ASTM D 2622	0,01	< 0,0005 (detection limit)
Aromatics (wt.%)		4,0	0.2
Cloud Point FT base oil component		n.d.	>40
Colour	ASTM D 1500	0,5	Less than 0.5

5 Blends were prepared with increasing amounts of the base oil and the Gp II base oil to determine the ratio at which the cloud point would become positive. The blends were prepared by heating a mixture of the two components to about 50°C under agitation until the blend become clear and bright, and by allowing the blend to cool down to ambient temperature (25°C). The blends were then kept at ambient temperature for 24 hours, 3 and 7 days, upon which the appearance was checked (see Table 5):

Table 5

Blend % wt. ratio Gp II to FT BO	Appearance after 24 hours at ambient temperature (25°C)	Appearance after 3 days at ambient temperature (25°C)	Appearance after 7 days at ambient temperature (25°C)
90:10	Clear and bright	Clear and bright	Clear and bright
88:12	Clear and bright	Clear and bright	Clear and bright
85:15	Clear and bright	Slight haze	Hazy
80:20	Clear and bright	Slight haze	Hazy
75:25	Clear and bright	Hazy	Hazy
70:30	Hazy	Hazy	Hazy

The above results clearly indicate that homogeneous blends according to the invention can be prepared containing high amounts of the paraffinic Fischer-Tropsch derived residual base oil components. A similar
 5 behaviour was found for blends comprising mineral oil derived Gp III base oils, although the limits to which a negative cloud point could be obtained was limited to about 5 % wt. addition of the Fischer-Tropsch components.

C L A I M S

1. A lubricating base oil blend comprising
 - (a) a mineral oil derived base oil having a saturates content of more than 90 wt%, a sulphur content of less than 0.03 wt% and a viscosity index of between 80-150, and
 - (b) a paraffinic base oil component having a viscosity at 100°C of from 7 to 30 cSt (7 to 30 mm²/s), wherein component (b) is an isomerised Fischer-Tropsch derived bottoms product having a ratio of percentage of recurring methylene carbons which are four or more carbons removed from an end group and a branch to the percentage of isopropyl carbon atoms, as determined by ¹³C-NMR, of below 8,2.
2. Base oil blend according to claim 1, wherein the mineral derived base oil component (a) is present in an amount of from 40 wt% to 95 wt%, based on the total weight of the oil blend.
3. Base oil blend according to claim 1 or claim 2 wherein the blend has a kinematic viscosity at 100 °C of greater than 12.0 cSt and a viscosity index of greater than 95.
4. Base oil blend according to claim any one of claims 1 to 3, wherein the viscosity index of component (a) is between 100 and 110.
5. Base oil blend according to any one of claims 1 to 4, wherein the cloud point of the blend has a value of below 0°C.
6. Base oil blend according to any one of claims 1 to 5, wherein component (b) has a pour point of below -28°C.
7. Process for the preparation of a lubricant base oil blend, comprising blending

a) a mineral oil derived base oil having a saturates content of more than 90 wt%, a sulphur content of less than 0.03 wt% and a viscosity index of between 80-150, and

b) a paraffinic base oil component having a viscosity at 100°C of from 7 to 30 cSt (7 to 30 mm²/s), wherein component (b) is an isomerised Fischer-Tropsch derived bottoms product having a ratio of percentage of recurring methylene carbons which are four or more carbons removed from an end group and a branch to the percentage of isopropyl carbon atoms, as determined by ¹³C-NMR, of below 8,2.

8. Process according to claim 7, wherein component (b) has an average degree of branching in the molecules of above 10 alkyl branches per 100 carbon atoms.

9. Process according to any one of claims 7 to 8, wherein the paraffinic base oil component (b) is a heavy bottom heavy bottom distillate fraction obtained from a Fischer-Tropsch derived wax or waxy raffinate feed by:

(a) hydrocracking/hydroisomerising a Fischer-Tropsch derived feed, wherein weight ratio of compounds having at least 60 or more carbon atoms and compounds having at least 30 carbon atoms in the Fischer-Tropsch derived feed is at least 0.2 and wherein at least 30 wt% of compounds in the Fischer-Tropsch derived feed have at least 30 carbon atoms;

(b) separating the product of step (a) into one or more distillate fraction(s) of lower boiling fractions and a broad range base oil precursor fraction and a heavy fraction such that the T90 wt% boiling point of the base oil precursor fraction is between 350 and 550 °C;

(c) performing a pour point reducing step to the broad range base oil precursor fraction obtained in step (b); and

(d) isolating the heavy bottom distillate fraction by distilling the product of step (c).